DOCUMENT RESUME

ED 176 235 CS 005 008

AUTHOR Spiro, Rand J.
TITLE Prior Knowledge and Story Processing: Integration, Selection, and Variation. Technical Report No. 138.
INSTITUTION Bolt, Beranek and Newman, Inc., Cambridge, Mass.; Illinois Univ., Urbana. Center for the Study of Reading.
SPONS AGENCY National Inst. of Education (DHEW), Washington, D.C.
PUB DATE Aug 79
CONTRACT 400-76-0116
NOTE 41p.

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS *Discourse Analysis; *Memory; *Reading Processes; *Reading Research; *Recall (Psychological); Semantics
IDENTIFIERS *Center for the Study of Reading (Illinois); *Schemata

ABSTRACT

Psychological research concerning several aspects of the relationship between existing knowledge schemata and the processing of text is summarized in this report. The first section is concerned with dynamic processes of story understanding, with emphasis on the integration of information. The role of prior knowledge in accommodating parts of stories received at different times to each other is illustrated, and schema change and schema maintenance as a basis for integration are considered. The second section emphasizes characteristics of prior knowledge as determinants of selectivity in memory. The issues discussed include: the expected future derivability of information, the degree of constraint provided by schemata, and the performance biases produced by attitudes. The third section investigates variability in the employment of schema-based processing. Among the factors shown in this section to affect the relative utilization of schemata in understanding stories are characteristics of texts and reading tasks and differences between individuals in discourse processing styles. Finally, future directions for schema-theoretic research are suggested. (FL)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED176235

CENTER FOR THE STUDY OF READING

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

Technical Report No. 138

PRIOR KNOWLEDGE AND STORY PROCESSING: INTEGRATION, SELECTION, AND VARIATION

Rand J. Spiro
University of Illinois at Urbana-Champaign

August 1979

University of Illinois
at Urbana-Champaign
51 Gerty Drive
Champaign, Illinois 61820

Bolt Beranek and Newman Inc.
50 Moulton Street
Cambridge, Massachusetts 02138

To appear in Poetics: The International Review for the Theory of Literature.

The research reported herein was supported in part by the National Institute of Education under Contract No. US-NIE-C-400-76-0116. The author wishes to acknowledge helpful discussions with William F. Brewer.

CS005018

Abstract

Psychological research concerning several aspects of the relationship between existing knowledge schemata and the processing of text is summarized. Some dynamic aspects of text processing are discussed first. Schema switching produces problems of accommodating the representation of early parts of text as to more recently processed information. The role of knowledge of the world in producing accommodation is emphasized. Situations where schemata need to be maintained rather than altered pose different problems for the integration of text information. Next, issues concerning selectivity in what is remembered from text are considered. Knowledge-based determinants of selectivity (such as the expected future derivability of information, the degree of constraint provided by schemata, and the performance biases produced by attitudes) are shown to contribute effects beyond those predictable from analysis of text-structural properties. The consequences of text and task characteristics and individual processing styles on the relative employment of knowledge-based versus text-based processes are illustrated next. Finally, future directions for schema-theoretic research are suggested.

Prior Knowledge and Story Processing: Integration, Selection, and Variation

The psychology of discourse comprehension is still in its infancy. Many issues are under debate; many important questions have not been asked. Yet, a consensus appears to have emerged on one fundamental point that must be a tenet of any theory of text understanding: What one already knows will affect what one can come to know. Meaning does not reside "in text." Rather, linguistic analysis of text provides a "blueprint" to guide and constrain the creation of meaning. Existing knowledge is brought to bear to enrich and embellish that blueprint. It is only in the interaction of the linguistic characteristics of texts and the knowledge employed in their understanding that psychological meaning emerges. (For summaries of the development of this viewpoint, see Anderson, 1977; Bransford & McCarrell, 1975; Morgan & Green, in press; and Spiro, in press-b) Psychological research has shown, for example, that the pre-existing knowledge structures (or schemata) active during comprehension determine which of a variety of qualitatively different interpretations will be imputed to a text (Anderson, Reynolds, Goetz, & Schallert, 1977), affect which extra-textual inferences (logical and pragmatic) will be incorporated in the text's semantic representation and be undifferentiable from literal text content (Brewer, 1977), and, at times, provide a necessary basis for the assignment of even a minimally coherent and plausible interpretation to otherwise apparently well-formed narrative (Bransford & Johnson, 1972).

The present paper discusses research bearing on three other aspects of knowledge-based discourse processing. The first section is concerned with dynamic processes of story understanding, with emphasis on the integration of information. First, the role of prior knowledge in accommodating parts of stories received at different times to each other is illustrated. Whereas the first part of this section is concerned with schema change, the second part focuses on schema maintenance as a basis for integration. The second section is concerned with selectivity in what is remembered from stories. Why are some things better remembered than others? Traditional accounts have emphasized structural importance, usually determined by analysis of the text in isolation (cf., Meyer, 1975) or of characteristics of stories in general (Rumelhart, 1977; Stein & Glenn, 1978). This section instead emphasizes characteristics of prior knowledge as determinants of selectivity in memory. Issues discussed include the following: the effects of schema-based derivability of information on the likelihood of that information being explicitly represented in memory; the need to conform with knowledge of the world as a prod to generate memories; the use of schemata as scaffoldings for the representation and subsequent recall of details from stories; and the effects of one's attitudes on the selective recall of attitude-relevant information. The third section investigates variability in the employment of schema-based processing. Factors shown to affect the relative utilization of schemata in understanding stories include characteristics of texts and reading tasks and differences between individuals in discourse processing styles.

Since I expect that readers of Poetics are not familiar with my work, rather than presenting an isolated piece of current research, I have chosen to review a variety of studies conducted in my laboratory pertinent to the relationship between story understanding and prior knowledge. I hope that a more comprehensive conception of my orientation will accordingly be transmitted to this new audience. I should also note that this paper emphasizes processes by which knowledge structures affect story understanding. No attempt is made to explicate the nature of the underlying schemata in other than a superficial manner. For discussions of knowledge structure theories compatible with the process orientation offered here, the reader is referred to Rumelhart and Ortony (1977) and Schank and Abelson (1977).

Knowledge Structures and Integration

Schema Change

As narrative proceeds, the knowledge schemata that best fit the text often change. Consider a simple example. An engaged couple discovers that their views differ seriously on the desirability of having children. They quarrel. Later in the story we find that the couple is happily married. At the earlier point in the story, knowledge about the importance of agreement between an engaged couple on the issue of having children would engender negative expectations for the future of their relationship. When we later discover the couple living in harmony, with no mention of the children issue or its resolution, two schema states are left in conflict for the reader--one that anticipates disharmony and a later one that contradicts that expectation.

How do readers deal with such contradictions? One possibility is that conflicting states are allowed to co-exist in the personal understanding of stories (as indicated, for example, by what is included in a re-telling). That is, need for reconciliation or accommodation may be noted, but no specific reconciling information is incorporated into the re-telling. Alternatively, conflicting schemata may produce a state of cognitive disequilibrium with an accompanying impetus for reconciliation. The world is known to be orderly. Unless there is something about a particular genre that permits violations of the world's orderliness (as in science fiction, for example), the disequilibrium will be corrected by bringing other relevant knowledge to bear to alter the story representation. Elements in the story may be distorted or new information may be imported. In a strong version of this hypothesis, the accommodating information becomes a part of the story's representation undifferentiable from information that was actually in the story. In other words, later parts of stories may induce new understandings of earlier parts or add new earlier parts, with the old understandings replaced. The process is one of reconstruction. What has already been read is not remembered as it was originally understood; rather, inferences about what must have transpired are made from what is known about later developments. A parallel may be drawn with the activities of a paleontologist who inferentially reconstructs a dinosaur utilizing an assortment of bone fragments (bits of stories) and knowledge about the anatomy and physiology of other dinosaurs (prototypic knowledge about the situations described in a given story). See Bartlett (1932) for further discussion of the reconstruction notion.

The co-existence and accommodative reconstruction hypotheses were tested empirically by Spiro (in press-a). Stories like the one about the engaged couple disagreeing about having children were presented to subjects induced to process them in a more natural manner than in typical laboratory studies of prose comprehension and recall.[1] Subjects in the experiment were instructed, after varying intervals, to recall the story as exactly as possible, without including any inferences or reactions. The results provided striking support for the accommodative reconstruction hypothesis over co-existence. Errors of a reconciling kind prevailed. Subjects tended to remember that the engaged couple had sought out counseling on their problem, had decided to adopt a child, or had not disagreed very strenuously about having children, to take a few examples. In another version of the story, one member of the engaged couple harbors strong feelings against having children and hesitates to inform the other one out of fear that it may doom their relationship. When he finally tells her, he finds that she feels the same way and has also been afraid to discuss it. They are very happy at this point, and their prospects for the future appears favorable. Later, the subjects find that the couple never got married and have not seen each other for years. Subjects exposed to this version incorporated into their recall of the story such things as earlier disagreements about having children, trouble with each other's parents, and a failure of the couple to have ever discussed the matter (leaving them unaware of their agreement about having children). In versions where the earlier and later parts of the story conform (e.g.,

the couple disagree about having children and are later found to have separated), errors in recall of the story were absent.

All of the reconciling importations and distortions had no basis in the story and were not even distantly inferentially related. Furthermore, after a sufficient interval had passed, subjects expressed as much confidence that they had read about their accommodative errors as they had about things they actually had read. (Processing mechanisms underlying these effects will be discussed in the section on derivability.) The distortions and importations of information, which were a response to a need to make what was read make sense given knowledge about the world, and which were based on idiosyncratic existing knowledge of what was most likely to account for contradictions of expected outcomes in a given situation, became equal partners with the literal and inferential content of the stories in the stories' cognitive representations. Engaged couples happy and in agreement at one time can become unhappy at another. Information such as this can logically co-exist; apparently, however, there is a psychological impetus that requires discrepancies with world views that are not resolved in the text to be resolved outside of it. A heuristic model of the processes that operate over time in producing accommodative reconstructions may be found in Spiro (1977).

Schema Maintenance

A change of schema, like that involved in the shift from "the troubled relationship" to "the happily married couple" discussed above, creates an

obvious need for integration. By contrast, it is easy to overlook the processes which produce integration when there is no clear shift in the schemata needed to be brought to bear in understanding a story. For example, it is often the case that a schema signalled for activation at one point in a text will also have to be applied at a later point, despite not being signalled clearly. In other words, besides situations calling for schema change, there will be cases where schemata must be maintained if integrated text understandings are to occur.

Consider this simple passage:

Sally was sitting in her bedroom. She was reading a book.
After a while she became hungry. She looked at the clock.

The meaning of the word clock in this context is something more than what would be found in a dictionary definition and differs from the prototypical clock that might come to mind by association to the word out of context. The reference for the clock in the story is particularized; it is understood to be a clock appropriate for a bedroom, as compared, for example, to the institutional type of wall clock that would be found in a classroom (Anderson & Shifrin, in press). Note that for the appropriate instantiation of the word to occur, the bedroom scenario explicitly signalled in the first sentence must still be utilized while processing the fourth sentence, despite the absence of an explicit signal.

Memory considerations aside, is schema maintenance an automatic by-product of schema activation? That it is not is demonstrated in an experiment by Spiro, Brummer, and Boggs (in preparation). They presented

eight-year-old children with passages like the one above. The task was to select from among four alternatives a picture that fit a word in the last sentence of the passage they had just read. In the passage about Sally, the children had to select a picture of a bedroom clock from amongst two other types of clocks and a distractor that was not mentioned in the story. To control for possible biases regarding typicality of instantiations, for half of the subjects the context was altered (e.g., Sally would be sitting in a classroom rather than a bedroom).

The crucial manipulation concerned the placement of the context information (e.g., bedroom) and the target word (e.g., clock). Half of the time they would both be in the same sentence (within-sentence condition), reducing the demands for schema maintenance. Even very young children are adept at making an appropriate instantiation inference under such conditions (see Anderson & Shifrin, in press). The other half of the time context and target were separated across sentences as in the earlier sample passage (between-sentence condition). Under this condition, schema maintenance demands are increased. Each subject read eighteen passages altogether, nine from each of the conditions.

Subjects were equally accurate in the between- and within-sentence conditions in selecting pictures appropriately instantiated as a function of the schema context. Furthermore, response to subsequent questions indicated they virtually always remembered the schema context. The possibility remains, however, that the integration of context and target was not occurring spontaneously; i.e., the integration may have been made

only when they were confronted with three different instantiations of a target word that had not been instantiated during reading. When the integration occurs at the time of test, it should be reflected in some increment in the time to answer the question over the time required to answer when the integration had occurred earlier. Looking only at those cases where a correct answer was given, a different pattern emerged for good and poor readers. Good readers showed no difference in decision times for the between- and within-sentence conditions. Poorer readers were as quick as the good readers in answering for the within-sentence condition, but significantly slower under the between-sentence condition. These results indicate that good readers spontaneously use their activated schemata to instantiate the meanings of words they encounter even when schema activation was not in the same text vicinity as the point at which integration is required. The less able readers, on the other hand, appear to spontaneously utilize their schemata only in the text vicinity of initial activation; they do not appear to be maintaining their schemata beyond that point. The result is a disjointed, one-sentence-at-a-time understanding of the stories. Since the poorer readers perform as well as the better ones in the within-sentence condition, but differ in the performance of the same task in the between-sentence condition (with other factors, such as differential memory for the context, not viable alternative explanations), one can conclude that schema maintenance is an isolatable component of story comprehension (i.e., one that does not automatically occur whenever related processes such as schema activation

do). Additionally, one would expect that the processing demands of schema maintenance would increase with more complex integrations and over longer stretches of discourse for all classes of readers.

Selective Recall from Stories: Beyond Structural Importance

One does not remember everything read in a story. What factors determine which parts of a story are likely to be recalled and which not? We have already illustrated one contributing factor in the discussion of accommodative reconstruction process and the experiment by Spiro (in press-a) involving stories about engaged couples: What is needed to make different parts of a story conform with knowledge of the world is very likely to be incorporated into story recall. Sometimes this will be information actually in the stories or inferable in a direct manner from them. Other times, as we have seen, the reconciling information will be subconsciously confabulated. It should be noted that in the Spiro (in press-a) experiment, distortions and importations of information were virtually nonexistent in other experimental conditions that did not engender conflict with world knowledge and beliefs.

The view of story recall that emerges is one in which partial data (specific memories from the stories--how scant these may be will be indicated in the sub-section on derivability immediately below) is combined with world knowledge to infer what must have occurred in a story. This view may be contrasted with a reproductive conception of story recall in which memory consists of reproducing stored traces of past

experience (i.e., stored memories of a story). Thus, one determinant of what is remembered from a story is what world knowledge dictates ought to have happened. However, such inferential reconstruction must be based on something. The remainder of this section will be devoted to selectivity in the specific memories (the partial data) that guide reconstruction.

Conventional wisdom holds that the likelihood of specific information being recalled is a function of that information's structural importance within a text. Ratings of structural importance (e.g., Johnson, 1970), propositional analyses (e.g., Meyer, 1975; van Dijk & Kintsch, 1976), or story grammar analyses (e.g., Mandler & Johnson, 1977; Rumelhart, 1977; Stein & Glenn, 1978) are employed to generate a hierarchy of ideas in a text. Ideas higher in the hierarchical representation are considered more structurally important and tend to be remembered better than ideas lower in the hierarchy. Although various contextual factors may mitigate the generalizability of such findings (see Spiro, 1975), the approach clearly illustrates an important contributing factor to selective recall of text information. However, structural importance is not the only variable of interest. The remainder of this section will explore effects on selective recall of knowledge variables that are orthogonal to conventional notions of structural importance.

Derivability of Information

Much of the information encountered in stories is somewhat predictable. Consider the following sequence, excerpted from a story:

(a) The karate champion hit the block.

(b) The block broke.

When karate champions hit blocks, the blocks usually break. Thus (b) is not surprising. On the other hand, karate champions occasionally fail in their demonstrations, so the information in (b) serves an uncertainty-reducing purpose and warrants inclusion in the text. How is (imperfectly) predictable information processed and represented in memory? Spiro (1977) hypothesized that such information is only superficially processed and receives either no explicit representation in long-term memory or a very attenuated representation. The information is essentially left to be derived later if needed.

An a priori argument for the hypothesis may be made on efficiency grounds. Much of the information that we are exposed to will never be needed again. If some of this information is derivable from other knowledge, not explicitly storing the information would result in more rapid processing at input and a cognitive economy of representation. Cognitive effort would then be directed to only those times when the information was subsequently needed, and not to indiscriminate effort to represent everything. Further support for the superficial-processing/left-to-be-derived hypothesis is that it helps explain the unusual memory errors in the study of accommodative reconstruction discussed earlier (Spiro, in press-a). If it is common for some information that is encountered not to be explicitly represented in memory, than derivation of memories would also be a common experience. Then, when trying to remember an event, if the pieces explicitly retrieved imperfectly conform with general world knowledge

(as in recalling the problems of the engaged couple and their later happiness, without accompanying explanation), one may simply assume that the missing information needed to produce a conventionally coherent memory was superficially processed at input. The information would then be derived from other knowledge as a matter of course. Hence, the prevalence of high-confidence distortions and importations of information in the accommodative reconstruction study.

Going beyond a priori arguments to empirical validation of the hypothesis is problemmatic. If information like (a) and (b) above is incorporated in stories, and recall of (b), the (imperfectly) derivable information, is tested, the results will be ambiguous. Successful recall of (b) could be due to retrieval of an explicitly stored memory or to generation from other knowledge. Likewise, failure to recall (b) might be due to an inability to access a stored memory or a failure to generate an unstored memory. This problem was circumvented in a study by Spiro and Esposito (1977) by the addition of information, like (c), inserted in the story before or after the (a) and (b) information.

(c) The karate champion had had a fight with his wife earlier. It was impairing his concentration.

The (c) information vitiates the force of (b)'s predictability from (a). If (c) is before (a) and (b) in the story, (b) can not be left to be derived later. Accurate recall of (b) should than occur. However, if (c) occurs later in the story than (a) and (b), (b) will be superficially processed and left to be derived, but its derivation will be blocked at

the time of test by (c). Hence errors in the recall of (b) should occur. However, if the predictable (b) information is durably represented in memory, it should be accurately recalled regardless of where the predictability-vitiating (c) information is placed.

Spiro and Esposito found error patterns consistent with the superficial processing hypothesis. Several stories, each incorporating (a), (b), and (c) type information, were presented to adult subjects. Where (c) was after (a) and (b) (and only in that condition), subjects responded in a later memory test either that (b) was not mentioned (it did not say in the story whether or not the block broke) or that the opposite of (b) was mentioned (it said in the story that the karate champion did not break the block). Various alternative interpretations of the results were ruled out by control conditions. For example, the results are not attributable to spontaneously "correcting" a representation of (b) after reading (c) or to differential availability of the (c) information at the time of the memory test.

More important for present purposes, the results can not be accounted for by the relative structural importance of the (b) information. For one thing, the (b) information tended to be central, as in the outcome of a karate champion's performance. In any case, the content of both versions of each story was the same. Thus (b) should occupy the same position in a text hierarchy when (c) is before or after (a) and (b). Rather it seems to be the case that the derivability of information from other knowledge is an additional factor to structural importance in

affecting the likelihood that information from stories will be durably represented in long-term memory and successfully recalled. (For further discussion of the effect and the mechanisms that might underlie it, see Spiro, Esposito, & Vondruska, 1978.)

Scaffoldings for Information

Another knowledge-based factor that contributes to the memorability of information beyond structural importance is the degree of constraint provided by the schemata brought to bear in understanding a story. Anderson, Spiro, and Anderson (1978) constructed two parallel narratives, one about a trip to a fine restaurant, the other about a shopping trip to a supermarket. The narratives were alike, sentence by sentence, in all respects other than their topics. For example, in both stories the same foods are purchased by the same people in the same order, the same extraneous events occur, etc. Note, however, that the "foods purchased" component of a "trip to a fine restaurant" schema is more highly constrained than the equivalent component of a "trip to a supermarket" schema. In the latter case, various combinations of purchases from various food item categories are permitted. For example, on one trip to a supermarket, only snacks and beverages may be purchased. At a restaurant, on the other hand, one typically orders foods from a specific set of categories in a predetermined order that typically does not vary from time to time (e.g., a before dinner drink, an appetizer, a soup, a salad, an entree, etc.). In other words, the restaurant schema provides a more finely differentiated scaffolding to facilitate the encoding and retrieval

of food items than does the supermarket schema. We predicted, therefore, that subjects recalling the entire narrative would remember more of the food items mentioned if they had read the restaurant rather than the supermarket version. This prediction was upheld, despite the fact that the structural importance of the food items in the parallel narratives was equal. Once again, characteristics of the knowledge brought to bear in understanding text have effects on the memorability of information beyond those predictable from the text's organization.

Besides schema constraint, the likelihood of information being recalled is related to schema-determined relevance. Returning to the Anderson, Spiro, and Anderson study, one would expect that the identity of the purchaser of a food item (the narratives involved a couple purchasing food) would have differential relevance in the context of restaurant and supermarket schemata. Since foods purchased in a supermarket are typically shared at a later meal, the significance of the purchaser's identity is less than in the case of a restaurant meal, where the person who orders the food typically eats it. As predicted, correct attribution of food items to their purchasers occurred more often for subjects who read the restaurant rather than the supermarket narrative.

What things are relevant will typically vary from one schema to the next. However, certain types of information tend to be generally relevant across schemata. For example, information bearing on the likely truth of a propositon will tend to be highly relevant in most schema contexts. Consider statements (d) and (e):

(d) Richard Nixon said X.

(e) The Washington Post reporter said X.

If you believe Richard Nixon is an information source of low credibility, and you read (d), you would be likely to remember that he was the source of the message. On the other hand, if you believe all newspaper reporters to have approximately equal credibility, and you have no reason to doubt X, the source information is less likely to endure than was the case with Nixon. This issue is discussed further in Spiro (1977).

Attitudes and Selective Recall

It is a common intuition that one's attitudes and beliefs will affect what one will recall from exposures to attitude-relevant information. Nevertheless, attempts to specify the nature of the relationship between attitudes and selective recall have a long history of failure. Early problems may be traced to overly simplistic hypotheses. For example, Levine and Murphy (1943) found data indicating that people remember more information favorable to their own attitude than unfavorable to it. After many years of mixed results regarding the favorableness hypothesis, Feather (1969, 1970), among others, pointed out that relative favorableness of a statement will have differing psychological impact depending on whether one agreed with the statement or not. Statements favorable to one's attitudinal positions with which one agrees and unfavorable statements with which one disagrees seem to form more balanced structures (cf. Feather, 1969, 1970; Heider, 1958) than do favorable statements with which one disagrees or unfavorable statements with which one agrees. Using favorableness and agreement in combination to determine relative balancedness, Feather found that subjects consistently tended to recall more balanced statements.

Spiro and Sherif (1975) noted, however, that if favorableness and agreement are correlated (i.e., one is more likely to agree with favorable statements and disagree with unfavorable ones), agreement decisions would be likely to produce a larger pool of balanced than imbalanced statements from an original set that had equal numbers of favorable and unfavorable statements. It is not surprising, then, to find an absolute superiority in recall of balanced statements. Spiro and Sherif argued that the appropriate test of selective recall would be to calculate the proportion of balanced statements recalled out of the total number of balanced statements created by the agreement ratings and compare it with the equivalent proportion calculated for imbalanced statements. With this revised analysis, it was found that statements that produce imbalanced structures are recalled relatively better than those that produce balanced ones. Furthermore, the effect was enhanced for those who had stronger, more ego-involving attitudes on the subject. Thus, one's attitudes, as well as characteristics of knowledge structures, affect selectivity of recall in a predictable manner.

Variability in Knowledge-Based Processing

Although discourse processing always involves interaction between information in text and prior knowledge, the relative contribution of prior knowledge will vary as a function of characteristics of the material being read, the purposes of reading, and differences between individuals in their processing styles. For example, texts on topics familiar to the intended audience will generally permit greater knowledge contributions

and may even require them if the writer leaves gaps on the assumption that the readers will be able to fill them in. On the other hand, some texts are more self-contained or integral (Spiro, 1977), and therefore, evoke less knowledge-based processing. Along similar lines, the criteria for evalauting texts may differ. As Olson (1977) has pointed out, the goodness of certain texts is determined by their fit with common sense experience and general knowledge of the world; other texts entail a "literate bias" that involves criteria more internal to the text.

Just as there is variability in the extent to which prior knowledge is used to understand text, once a text has been comprehended it may then be assimilated to existing knowledge structures in varying degrees. At one extreme, the representation of a text may be totally differentiated from related knowledge, becoming a separate "compartment" in knowledge and maintaining its particular identity. At the other extreme, assimilation of aspects of a text to various related knowledge structures may result in a near total loss of the text's particular identity; parts of the text (or all of it) will be remembered, but as something related to some general topic, not as parts of <u>the</u> text. For example, when studying law, it is essential that the texts of individual cases maintain their particular identity. On the other hand, if one has been following developments in Iran's crisis, new information on the subject encountered in a newspaper article will tend to be used merely to update the prior knowledge. It is unlikely that the article will be represented in memory as a cohesive whole and remembered as information from that particular article. Rather,

the text will be assimilated to (and perhaps alter) knowledge structures on the Iranian situation.

The purposes for reading at a given time will affect the relative influence of prior knowledge on comprehension and the relative influence of what has been comprehended on the composition of knowledge structures. A manipulation in the Spiro (in press-a) study of accommodative reconstruction, discussed earlier, was intended to bear on both aspects of the relationship between knowledge and comprehension. Some subjects were informed that the stories (e.g., about the engaged couple and their disagreement about having children) were true and that the experimenter was a clinical psychologist concerned with the way people understand situations involving interpersonal relations. It was expected that this orientation would induce both greater use of prior knowledge in understanding stories and greater assimilation of the stories' content to the general store of knowledge concerning similar situations; in general, a greater degree of interaction with prior knowledge was expected. When later developments (e.g., finding out the couple with the serious problem ended up happily married) evoke schemata imperfectly conforming with those generated earlier, the high degree of interaction of the story content with prior knowledge would be expected to produce a heightened sense of conflict between the schema states and a corresponding strongly felt need for reconciliation, as well as a broad base for the generation or reconstruction of accommodating information. It was in this experimental condition that the gross reconciling errors of recall discussed earlier tended to occur. (It should be noted that at the time of recall the subjects were informed that they had

been deceived, and that they were really participating in a memory experiment. They were told to recall only what they had read and to omit all inferences and reactions that were not in the story.)

Other subjects in this experiment were told that it was merely a study of memory. They were to read the story and would later be asked to recall it as accurately as possible. Nothing was mentioned about the story being true. It was expected that subjects in this condition would utilize their prior knowledge only as much as was needed to construct a minimal plausible interpretation of the story and would not integrate what was learned from the story with existing knowledge about similar situations. Rather, since a high level of accurate recall was the subjects' goal, with interference from related knowledge perhaps producing recall error, a strategy of compartmentalizing the story representation seemed to be a possibility. In that case the impetus for reconciliation and the knowledge base for subconscious accommodation might be less than was the case with the other set of instructions (see Spiro, 1977, for a discussion of ramifications of memory sets for cognitive interaction). Incidence of accommodative error would then be expected to be less than in the other condition, a prediction borne out by the data. Accommodating errors rarely occurred when subjects were given the conventional memory instructions. In general, then, operation of schema-based processes may be attenuated by characteristics of the reading situation that promote compartmentalization of the text's cognitive representation.

Finally, the extent to which knowledge structures are utilized in text understanding may be influenced by characteristics of an individual's text processing style. It may be the case that some readers tend to deploy relatively more processing resources towards fitting information in text with prior knowledge, while other readers prefer analyses of text as more self-contained units.

Although conclusions are not definitive at this point, it appears likely that some readers employ schema-based processing to a greater extent than others. Furthermore, for these readers their text processing tendencies seem to be part of a pattern of style preferences that extends to other cognitive tasks. Consider the task requirements of an embedded figures task. One must discover where a target geometric shape that has been memorized is embedded in a complex line and shading configuration currently in the visual field. In other words, a relationship between two structures must be analyzed simultaneously or in rapid succession, with one of the structures externally present and the other internally represented. The processes involved in an embedded figures task bear an abstract resemblance to the requirements in processing text of analyzing the structure of an external text as it relates to internal cognitive structures. Will individuals who are relatively "stimulus-bound" and perform poorly on an embedded figures test also evince less schema-based processing in understanding text (after statistically controlling for correlations with overall verbal ability)? Results thus far indicate a positive response.

Spiro and Tirre (1979) had adult subjects read either the restaurant or supermarket narrative from the Anderson, Spiro, and Anderson (1978) study. Superiority in recall of food items from the former narrative compared to the latter, reflecting the use of schemata as a scaffolding for the encoding and recall of text information, was found for subjects with high embedded figures test scores but was absent for those with low scores. In another study (discussed in Spiro, Note 1), children read stories where either schema-based or text-based processing was inhibited by removing information signaling which schemata needed to be activated or by removing all punctuation and capitalization, respectively. Deleterious effects on comprehension were greater with the former manipulation for high embedded figures test scorers and were greater with the latter manipulation for the low embedded figures test scorers. Again, certain individuals seem to rely relatively more on prior knowledge during the processing of narratives.

Future Directions

Three knowledge-based aspects of text processing have been discussed in this paper; other aspects have been the subject of successful research as well. However, the development of schema-theoretic approaches has lagged in several areas. The list below suggests some of the issues that require greater attention if a comprehensive understanding of the role of existing knowledge in the processing of text is to eventuate.

1. Schema selection: How are schemata evoked by texts and by the contexts in which texts are encountered? This problem is more serious with

written than oral discourse, given the more decontextualized character of the former.

2. Ongoing schema construction: One can not have a pre-packaged schema for every text situation one might encounter. When appropriate schemata are not available, how are they constructed? A better understanding of processes of schema combination and the transfer of schema for a given situation to other situations with structural similarities is required. In fact, a more refined understanding of the psychology of "thinking" and problem solving may be necessary to really understand the processes of adapting to novelty in text. Tempering these remarks, it should be kept in mind that authors of texts have a Gricean obligation to try to provide explicit information when anticipating the absence of appropriate schemata in their intended audience. Thus the problem may not occur as often as one may think.

3. Sub-processes and their interaction: How do components of schema-based processing interact and how are they deployed and controlled? Both conscious and tacit management of diverse knowledge-based processing activities need to be studied. Which processes are better considered as parts of basic text-processing "competence" and which are more related to "performance" notions such as the efficiency of knowledge-based processing?

4. Aesthetics: Accounting for how prior knowledge is used to form a coherent semantic representation of text does not explain how what one already knows affects aesthetic awareness. Very little can be gleaned

from current schema-theoretic work that can inform a psychology of the appreciation of literature.

Reference Note

1. Spiro, R. J. Beyond schema availability. Invitational address to the National Reading Conference Annual Meeting, St. Petersburgh, Fla., 1978.

References

Anderson, R. C. Schema-directed processes in language comprehension (Tech. Rep. No. 50). Urbana: University of Illinois, Center for the Study of Reading, July 1977.

Anderson, R. C., Reynolds, R. E., Schallert, D. L., & Goetz, E. T. Frameworks for comprehending discourse. American Educational Research Journal, 1977, 14, 367-382.

Anderson, R. C., & Shifrin, Z. The meaning of words in context. In R. J. Spiro, B. C. Bruce, & W. F. Brewer (Eds.), Theoretical issues in reading comprehension. Hillsdale, N.J.: Erlbaum, in press.

Anderson, R. C., Spiro, R. J., & Anderson, M. C. Schemata as scaffolding for the representation of information in connected discourse. American Educational Research Journal, 1978, 15, 433-440.

Bartlett, F. C. Remembering. Cambridge: Cambridge University Press, 1932.

Bransford, J. D., & Johnson, M. K. Contextual prerequisites for understanding: Some investigations of comprehension and recall. Journal of Verbal Learning and Verbal Behavior, 1972, 11, 717-726.

Bransford, J. D., & McCarrell, N. S. A sketch of a cognitive approach to comprehension. In W. B. Weimer & D. S. Palermo (Eds.), Cognition and the symbolic processes. Hillsdale, N.J.: Erlbaum, 1975.

Brewer, W. F. Memory for the pragmatic implications of sentences (Tech. Rep. No. 65). Urbana: University of Illinois, Center for the Study of Reading, October 1977.

Feather, N. T. Attitude and selective recall. Journal of Personality and Social Psychology, 1969, 12, 310-319.

Feather, N. T. Balancing and positivity effects in social recall. Journal of Personality, 1970, 38, 602-628.

Heider, F. The psychology of interpersonal relations. New York: Wiley, 1958.

Johnson, R. E. Recall of prose as a function of the structural importance of the linguistic units. Journal of Verbal Learning and Verbal Behavior, 1970, 9, 12-20.

Levine, J., & Murphy, G. The learning and forgetting of controversial material. Journal of Abnormal Social Psychology, 1943, 38, 507-517.

Mandler, J. M., & Johnson, N. S. Remembrance of things parsed: Story structure and recall. Cognitive Psychology, 1977, 9, 111-151.

Meyer, B. J. F. The organization of prose and its effects on memory. Amsterdam: North Holland, 1975.

Morgan, J. L., & Green, G. M. Pragmatics and reading comprehension. In R. J. Spiro, B. C. Bruce, & W. F. Brewer (Eds.), Theoretical issues in reading comprehension. Hillsdale, N. J.: Erlbaum, in press.

Olson, D. R. The language of instruction: The literate bias of schooling. In R. C. Anderson, R. J. Spiro, & W. E. Montague (Eds.), Schooling and the acquisition of knowledge. Hillsdale, N.J.: Erlbaum, 1977.

Rumelhart, D. E. Understanding and summarizing brief stories. In D. LaBerge & S. J. Samuels (Eds.), Basic processes in reading. Hillsdale, N.J.: Erlbaum, 1977.

Rumelhart, D. E., & Ortony, A. The representation of knowledge in memory. In R. C. Anderson, R. J. Spiro, & W. E. Montague (Eds.), Schooling and the acquisition of knowledge. Hillsdale, N.J.: Erlbaum, 1977.

Schank, R., & Abelson, R. P. Scripts, plans, goals and understanding. Hillsdale, N.J.: Erlbaum, 1977.

Spiro, R. J. Inferential reconstruction in memory for connected discourse (Tech. Rep. No. 2). Urbana: University of Illinois, Center for the Study of Reading, October 1975.

Spiro, R. J. Remembering information from text: The "State of Schema" approach. In R. C. Anderson, R. J. Spiro, & W. E. Montague (Eds.), Schooling and the acquisition of knowledge. Hillsdale, N.J.: Erlbaum, 1977.

Spiro, R. J. Accommodative reconstruction in prose recall. Journal of Verbal Learning and Verbal Behavior, in press. (a)

Spiro, R. J. Constructive aspects of prose comprehension and recall. In R. J. Spiro, B. C. Bruce, & W. F. Brewer (Eds.), Theoretical issues in reading comprehension. Hillsdale, N.J.: Erlbaum, in press. (b)

Spiro, R. J., & Esposito, J. Superficial processing of explicit inferences in text (Tech. Rep. No. 60). Urbana: University of Illinois, Center for the Study of Reading, December 1977.

Spiro, R. J., Esposito, J., & Vondruska, R. The representation of desirable information in memory: When what might have been left unsaid is said. In D. Waltz (Ed.), TINLAP-2: Theoretical issues in natural language processing-2. New York: Association of Computing Machinery and Association for Computational Linguistics, 1978.

Spiro, R. J., & Sherif, C. W. Consistency and relativity in selective recall with differing ego-involvement. British Journal of Social and Clinical Psychology, 1975, 14, 351-361.

Spiro, R. J., & Tirre, W. C. Individual differences in schema utilization during discourse processing (Tech. Rep. No. 111). Urbana: University of Illinois, Center for the Study of Reading, January 1979.

Stein, N. L., & Glenn, C. G. An analysis of story comprehension in elementary school children. In R. Freedle (Ed.), Discourse processing: Multi-disciplinary perspectives. Hillsdale, N.J.: Erlbaum, 1978.

van Dijk, T. A., & Kintsch, W. Cognitive psychology and discourse: Recalling and summarizing stories. In W. U. Dressler (Ed.), Trends in text linguistics. New York: de Gruyter, 1976.

Footnote

[1]It should be noted that in the study cited, the information about the couple eventually marrying was encountered as an auxiliary to the story rather than as part of the story itself. In other studies, similar results were obtained when the contradictory information was a part of the story.

CENTER FOR THE STUDY OF READING

READING EDUCATION REPORTS

No. 1: Durkin, D. *Comprehension Instruction—Where are You?*, October 1977. (ERIC Document Reproduction Service No. ED 146 566, 14p., PC-$1.82, MF-$.83)

No. 2: Asher, S. R. *Sex Differences in Reading Achievement*, October 1977. (ERIC Document Reproduction Service No. ED 145 567, 30p., PC-$3.32, MF-$.83)

No. 3: Adams, M. J., Anderson, R. C., & Durkin, D. *Beginning Reading: Theory and Practice*, November 1977. (ERIC Document Reproduction Service No. ED 151 722, 15p., PC-$1.82, MF-$.83)

No. 4: Jenkins, J. R., & Pany, D. *Teaching Reading Comprehension in the Middle Grades*, January 1978. (ERIC Document Reproduction Service No. ED 151 756, 36p., PC-$3.32, MF-$.83)

No. 5: Bruce, B. *What Makes a Good Story?*, June 1978. (ERIC Document Reproduction Service No. ED 158 222, 16p., PC-$1.82, MF-$.83)

No. 6: Anderson, T. H. *Another Look at the Self-Questioning Study Technique*, September 1978. (ERIC Document Reproduction Service No. ED 163 441, 19p., PC-$1.82, MF-$.83)

No. 7: Pearson, P. D., & Kamil, M. L. *Basic Processes and Instructional Practices in Teaching Reading*, December 1978. (ERIC Document Reproduction Service No. ED 165 118, 29p., PC-$3.32, MF-$.83)

No. 8: Collins, A., & Haviland, S. E. *Children's Reading Problems*, June 1979.

No. 9: Schallert, D. L., & Kleiman, G. M. *Some Reasons Why Teachers are Easier to Understand than Textbooks*, June 1979.

No. 10: Baker, L. *Do I Understand or Do I not Understand: That is the Question*, July 1979.

No. 11: Anderson, R. C., & Freebody, P. *Vocabulary Knowledge and Reading*, August 1979.

CENTER FOR THE STUDY OF READING

TECHNICAL REPORTS

No. 1: Halff, H. M. ***Graphical Evaluation of Hierarchical Clustering Schemes,*** October 1975. (ERIC Document Reproduction Service No. ED 134 926, 11p., PC-$1.82, MF-$.83)

No. 2: Spiro, R. J. ***Inferential Reconstruction in Memory for Connected Discourse,*** October 1975. (ERIC Document Reproduction Service No. ED 136 187, 81p., PC-$6.32, MF-$.83)

No. 3: Goetz, E. T. ***Sentences in Lists and in Connected Discourse,*** November 1975. (ERIC Document Reproduction Service No. ED 134 927, 75p., PC-$4.82, MF-$.83)

No. 4: Alessi, S. M., Anderson, T. H., & Biddle, W. B. ***Hardware and Software Considerations in Computer Based Course Management,*** November 1975. (ERIC Document Reproduction Service No. ED 134 928, 21p., PC-$1.82, MF-$.83)

No. 5: Schallert, D. L. ***Improving Memory for Prose: The Relationship between Depth of Processing and Context,*** November 1975. (ERIC Document Reproduction Service No. ED 134 929, 37p., PC-$3.32, MF-$.83)

No. 6: Anderson, R. C., Goetz, E. T., Pichert, J. W., & Halff, H. M. ***Two Faces of the Conceptual Peg Hypothesis,*** January 1976. (ERIC Document Reproduction Service No. ED 134 930, 29p., PC-$3.32, MF-$.83)

No. 7: Ortony, A. ***Names, Descriptions, and Pragmatics,*** February 1976. (ERIC Document Reproduction Service No. ED 134 931, 25p., PC-$1.82, MF-$.83)

No. 8: Mason, J. M. ***Questioning the Notion of Independent Processing Stages in Reading,*** February 1976. (*Journal of Educational Psychology,* 1977, ***69,*** 288-297)

No. 9: Siegel, M. A. ***Teacher Behaviors and Curriculum Packages: Implications for Research and Teacher Education,*** April 1976. (ERIC Document Reproduction Service No. ED 134 932, 42p., PC-$3.32, MF-$.83)

No. 10: Anderson, R. C., Pichert, J. W., Goetz, E. T., Schallert, D. L., Stevens, K. C., & Trollip, S. R. ***Instantiation of General Terms,*** March 1976. (ERIC Document Reproduction Service No. ED 134 933, 30p., PC-$3.32, MF-$.83)

No. 11: Armbruster, B. B. ***Learning Principles from Prose: A Cognitive Approach Based on Schema Theory,*** July 1976. (ERIC Document Reproduction Service No. ED 134 934, 48p., PC-$3.32, MF-$.83)

No. 12: Anderson, R. C., Reynolds, R. E., Schallert, D. L., & Goetz, E. T. ***Frameworks for Comprehending Discourse,*** July 1976. (ERIC Document Reproduction Service No. ED 134 935, 33p., PC-$3.32, MF-$.83)

No. 13: Rubin, A. D., Bruce, B. C., & Brown, J. S. ***A Process-Oriented Language for Describing Aspects of Reading Comprehension,*** November 1976. (ERIC Document Reproduction Service No. ED 136 188, 41p., PC-$3.32, MF-$.83)

No. 14: Pichert, J. W., & Anderson, R. C. ***Taking Different Perspectives on a Story,*** November 1976. (ERIC Document Reproduction Service No. ED 134 936, 30p., PC-$3.32, MF-$.83)

No. 15: Schwartz, R. M. ***Strategic Processes in Beginning Reading,*** November 1976. (ERIC Document Reproduction Service No. ED 134 937, 19p., PC-$1.82, MF-$.83)

No. 16: Jenkins, J. R., & Pany, D. ***Curriculum Biases in Reading Achievement Tests,*** November 1976. (ERIC Document Reproduction Service No. ED 134 938, 24p., PC-$1.82, MF-$.83)

No. 17: Asher, S. R., Hymel, S., & Wigfield, A. ***Children's Comprehension of High- and Low-Interest Material and a Comparison of Two Cloze Scoring Methods,*** November 1976. (ERIC Document Reproduction Service No. ED 134 939, 32p., PC-$3.32, MF-$.83)

No. 18: Brown, A. L., Smiley, S. S., Day, J. D., Townsend, M. A. R., & Lawton, S. C. ***Intrusion of a Thematic Idea in Children's Comprehension and Retention of Stories,*** December 1976. (ERIC Document Reproduction Service No. ED 136 189, 39p., PC-$3.32, MF-$.83)

No. 19: Kleiman, G. M. ***The Prelinguistic Cognitive Basis of Children's Communicative Intentions,*** February 1977. (ERIC Document Reproduction Service No. ED 134 940, 51p., PC-$4.82, MF-$.83)

No. 20: Kleiman, G. M. ***The Effect of Previous Context on Reading Individual Words,*** February 1977. (ERIC Document Reproduction Service No. ED 134 941, 76p., PC-$6.32, MF-$.83)

No. 21: Kane, J. H., & Anderson, R. C. ***Depth of Processing and Interference Effects in the Learning and Remembering of Sentences,*** February 1977. (ERIC Document Reproduction Service No. ED 134 942, 29p., PC-$3.32, MF-$.83)

No. 22: Brown, A. L., & Campione, J. C. ***Memory Strategies in Learning: Training Children to Study Strategically,*** March 1977. (ERIC Document Reproduction Service No. ED 136 234, 54p., PC-$4.82, MF-$.83)

No. 23: Smiley, S. S., Oakley, D. D., Worthen, D., Campione, J. C., & Brown, A. L. ***Recall of Thematically Relevant Material by Adolescent Good and Poor Readers as a Function of Written Versus Oral Presentation,*** March 1977. (ERIC Document Reproduction Service No. ED 136 235, 23p., PC-$1.82, MF$-.83)

No. 24: Anderson, R. C., Spiro, R. J., & Anderson, M. C. ***Schemata as Scaffolding for the Representation of Information in Connected Discourse,*** March 1977. (ERIC Document Reproduction Service No. ED 136 236, 18p., PC-$1.82, MF-$.83)

No. 25: Pany, D., & Jenkins, J. R. ***Learning Word Meanings: A Comparison of Instructional Procedures and Effects on Measures of Reading Comprehension with Learning Disabled Students,*** March 1977. (ERIC Document Reproduction Service No. ED 136 237, 34p., PC-$3.32, MF-$.83)

No. 26: Armbruster, B. B., Stevens, R. J., & Rosenshine, B. ***Analyzing Content Coverage and Emphasis: A Study of Three Curricula and Two Tests,*** March 1977. (ERIC Document Reproduction Service No. ED 136 238, 22p., PC-$1.82, MF-$.83)

No. 27: Ortony, A., Reynolds, R. E., & Arter, J. A. ***Metaphor: Theoretical and Empirical Research,*** March 1977. (ERIC Document Reproduction Service No. ED 137 752, 63p., PC-$4.82, MF-$.83)

No. 28: Ortony, A. ***Remembering and Understanding Jabberwocky and Small-Talk,*** March 1977. (ERIC Document Reproduction Service No. ED 137 753, 36p., PC-$3.32, MF-$.83)

No. 29: Schallert, D. L., Kleiman, G. M., & Rubin, A. D. ***Analysis of Differences between Oral and Written Language,*** April 1977. (ERIC Document Reproduction Service No. ED 144 038, 33p., PC-$3.32, MF-$.83)

No. 30: Goetz, E. T., & Osborn, J. ***Procedures for Sampling Texts and Tasks in Kindergarten through Eighth Grade,*** April 1977. (ERIC Document Reproduction Service No. ED 146 565, 80p., PC-$6.32, MF-$.83)

No. 31: Nash-Webber, B. ***Anaphora: A Cross-Disciplinary Survey,*** April 1977. (ERIC Document Reproduction Service No. ED 144 039, 43p., PC-$3.32, MF-$.83)

No. 32: Adams, M. J., & Collins, A. ***A Schema-Theoretic View of Reading Comprehension,*** April 1977. (ERIC Document Reproduction Service No. ED 142 971, 49p., PC-$3.32, MF-$.83)

No. 33: Huggins, A. W. F. ***Syntactic Aspects of Reading Comprehension,*** April 1977. (ERIC Document Reproduction Service No. ED 142 972, 68p., PC-$4.82, MF-$.83)

No. 34: Bruce, B. C. ***Plans and Social Actions,*** April 1977. (ERIC Document Reproduction Service No. ED 149 328, 45p., PC-$3.32, MF-$.83)

No. 35: Rubin, A. D. ***Comprehension Processes in Oral and Written Language,*** April 1977. (ERIC Document Reproduction Service No. ED 150 550, 61p., PC-$4.82, MF-$.83)

No. 36: Nash-Webber, B., & Reiter, R. ***Anaphora and Logical Form: On Formal Meaning Representation for Natural Language,*** April 1977. (ERIC Document Reproduction Service No. ED 142 973, 42p., PC-$3.32, MF-$.83)

No. 37: Adams, M. J. ***Failures to Comprehend and Levels of Processing in Reading,*** April 1977. (ERIC Document Reproduction Service No. ED 145 410, 51p., PC-$4.82, MF-$.83)

No. 38: Woods, W. A. ***Multiple Theory Formation in High-Level Perception,*** April 1977. (ERIC Document Reproduction Service No. ED 144 020, 58p., PC-$4.82, MF-$.83)

No. 40: Collins, A., Brown, J. S., & Larkin, K. M. ***Inference in Text Understanding,*** December 1977. (ERIC Document Reproduction Service No. ED 150 547, 48p., PC-$3.32, MF-$.83)

No. 41: Anderson, R. C., & Pichert, J. W. ***Recall of Previously Unrecallable Information Following a Shift in Perspective,*** April 1977. (ERIC Document Reproduction Service No. ED 142 974, 37p., PC-$3.32, MF-$.83)

No. 42: Mason, J., Osborn, J., & Rosenshine, B. ***A Consideration of Skill Hierarchy Approaches to the Teaching of Reading,*** December 1977. (ERIC Document Reproduction Service No. ED 150 549, 176p., PC-$12.32, MF-$.83)

No. 43: Collins, A., Brown, A. L., Morgan, J. L., & Brewer, W. F. ***The Analysis of Reading Tasks and Texts,*** April 1977. (ERIC Document Reproduction Service No. ED 145 404, 96p., PC-$6.32, MF-$.83)

No. 44: McClure, E. ***Aspects of Code-Switching in the Discourse of Bilingual Mexican-American Children,*** April 1977. (ERIC Document Reproduction Service No. ED 142 975, 38p., PC-$3.32, MF-$.83)

No. 45: Schwartz, R. M. ***Relation of Context Utilization and Orthographic Automaticity in Word Identification,*** May 1977. (ERIC Document Reproduction Service No. ED 137 762, 27p., PC-$3.32, MF-$.83)

No. 46 Anderson, R. C., Stevens, K. C., Shifrin, Z., & Osborn, J. ***Instantiation of Word Meanings in Children,*** May 1977. (ERIC Document Reproduction Service No. ED 142 976, 22p., PC-$1.82, MF-$.83)

No. 47 Brown, A. L. ***Knowing When, Where, and How to Remember: A Problem of Metacognition,*** June 1977. (ERIC Document Reproduction Service No. ED 146 562, 152p., PC-$10.82, MF-$.83)

No. 48 Brown, A. L., & DeLoache, J. S. ***Skills, Plans, and Self-Regulation,*** July 1977. (ERIC Document Reproduction Service No. ED 144 040, 66p., PC-$4.82, MF-$.83)

No. 49 Goetz, E. T. ***Inferences in the Comprehension of and Memory for Text,*** July 1977. (ERIC Document Reproduction Service No. ED 150 548, 97p., PC-$6.32, MF-$.83)

No. 50 Anderson, R. C. ***Schema-Directed Processes in Language Comprehension,*** July 1977. (ERIC Document Reproduction Service No. ED 142 977, 33p., PC-$3.32, MF-$.83)

No. 51 Brown, A. L. ***Theories of Memory and the Problems of Development: Activity, Growth, and Knowledge,*** July 1977. (ERIC Document Reproduction Service No. ED 144 041, 59p., PC-$4.82, MF-$.83)

No. 52 Morgan, J. L. ***Two Types of Convention in Indirect Speech Acts,*** July 1977. (ERIC Document Reproduction Service No. ED 145 405, 40p., PC-$3.32, MF-$.83)

No. 53 Brown, A. L., Smiley, S. S., & Lawton, S. C. ***The Effects of Experience on the Selection of Suitable Retrieval Cues for Studying from Prose Passages,*** July 1977. (ERIC Document Reproduction Service No. ED 144 042, 30p., PC-$3.32, MF-$.83)

No. 54 Fleisher, L. S., & Jenkins, J. R. ***Effects of Contextualized and Decontextualized Practice Conditions on Word Recognition,*** July 1977. (ERIC Document Reproduction Service No. ED 144 043, 37p., PC-$3.32, MF-$.83)

No. 55 Jenkins, J. R., & Larson, K. ***Evaluating Error Correction Procedures for Oral Reading,*** June 1978. (ERIC Document Reproduction Service No. ED 158 224, 34p., PC-$3.32, MF-$.83)

No. 56 Anderson, T. H., Standiford, S. N., & Alessi, S. M. ***Computer Assisted Problem Solving in an Introductory Statistics Course,*** August 1977. (ERIC Document Reproduction Service No. ED 146 563, 26p., PC-$3.32, MF-$.83)

No. 57 Barnitz, J. ***Interrelationship of Orthography and Phonological Structure in Learning to Read,*** August 1977. (ERIC Document Reproduction Service No. ED 150 546, 62p., PC-$4.82, MF-$.83)

No. 58 Mason, J. M. ***The Role of Strategy in Reading in the Mentally Retarded,*** September 1977. (ERIC Document Reproduction Service No. ED 145 406, 28p., PC-$3.32, MF-$.83)

No. 59 Mason, J. M. ***Reading Readiness: A Definition and Skills Hierarchy from Preschoolers' Developing Conceptions of Print,*** September 1977. (ERIC Document Reproduction Service No. ED 145 403, 57p., PC-$4.82, MF-$.83)

No. 60 Spiro, R. J., & Esposito, J. J. ***Superficial Processing of Explicit Inferences in Text,*** December 1977. (ERIC Document Reproduction Service No. ED 150 545, 27p., PC-$3.32, MF-$.83)

No. 65 Brewer, W. F. ***Memory for the Pragmatic Implications of Sentences,*** October 1977. (ERIC Document Reproduction Service No. ED 146 564, 27p., PC-$3.32, MF-$.83)

No. 66 Brown, A. L., & Smiley, S. S. ***The Development of Strategies for Study Prose Passages,*** October 1977. (ERIC Document Reproduction Service No. ED 145 371, 59p., PC-$4.82, MF-$.83)

No. 68 Stein, N. L., & Nezworski, T. ***The Effects of Organization and Instructional Set on Story Memory,*** January 1978. (ERIC Document Reproduction Service No. ED 149 327, 41p., PC-$3.32, MF-$.83)

No. 69 Stein, N. L. ***How Children Understand Stories: A Developmental Analysis,*** March 1978. (ERIC Document Reproduction Service No. ED 153 205, 68p., PC-$4.82, MF-$.83)

No. 76 Thieman, T. J., & Brown, A. L. ***The Effects of Semantic and Formal Similarity on Recognition Memory for Sentences in Children,*** November 1977. (ERIC Document Reproduction Service No. ED 150 551, 26p., PC-$3.32, MF-$.83)

No. 77 Nash-Webber, B. L. ***Inferences in an Approach to Discourse Anaphora,*** January 1978. (ERIC Document Reproduction Service No. ED 150 552, 30p., PC-$3.32, MF-$.83)

No. 78 Gentner, D. ***On Relational Meaning: The Acquisition of Verb Meaning,*** December 1977. (ERIC Document Reproduction Service No. ED 149 325, 46p., PC-$3.32, MF-$.83)

No. 79 Royer, J. M. ***Theories of Learning Transfer,*** January 1978. (ERIC Document Reproduction Service No. ED 149 326, 55p., PC-$4.82, MF-$.83)

No. 80 Arter, J. A., & Jenkins, J. R. ***Differential Diagnosis-Prescriptive Teaching: A Critical Appraisal,*** January 1978. (ERIC Document Reproduction Service No. ED 150 578, 104p., PC-$7.82, MF-$.83)

No. 81 Shoben, E. J. ***Choosing a Model of Sentence Picture Comparisons: A Reply to Catlin and Jones,*** February 1978. (ERIC Document Reproduction Service No. ED 150 577, 30p., PC-$3.32, MF-$.83)

No. 82: Steffensen, M. S. ***Bereiter and Engelmann Reconsidered: The Evidence from Children Acquiring Black English Vernacular,*** March 1978. (ERIC Document Reproduction Service No. ED 153 204, 31p., PC-$3.32, MF-$.83)

No. 83: Reynolds, R. E., Standiford, S. N., & Anderson, R. C. ***Distribution of Reading Time When Questions are Asked about a Restricted Category of Text Information,*** April 1978. (ERIC Document Reproduction Service No. ED 153 206, 34p., PC-$3.32, MF-$.83)

No. 84: Baker, L. ***Processing Temporal Relationships in Simple Stories: Effects of Input Sequence,*** April 1978. (ERIC Document Reproduction Service No. ED 157 016, 54p., PC-$4.82, MF-$.83)

No. 85: Mason, J. M., Knisely, E., & Kendall, J. ***Effects of Polysemous Words on Sentence Comprehension,*** May 1978. (ERIC Document Reproduction Service No. ED 157 015, 34p., PC-$3.32, MF-$.83)

No. 86: Anderson, T. H., Wardrop, J. L., Hively W., Muller, K. E., Anderson, R. I., Hastings, C. N., & Fredericksen, J. ***Development and Trial of a Model for Developing Domain Referenced Tests of Reading Comprehension,*** May 1978. (ERIC Document Reproduction Service No. ED 157 036, 69p., PC-$4.82, MF-$.83)

No. 87: Andre, M. E. D. A., & Anderson, T. H. ***The Development and Evaluation of a Self-Questioning Study Technique,*** June 1978. (ERIC Document Reproduction Service No. ED 157 037, 37p., PC-$3.32, MF-$.83)

No. 88: Bruce, B. C., & Newman, D. ***Interacting Plans,*** June 1978. (ERIC Document Reproduction Service No. ED 157 038, 100p., PC-$6.32, MF-$.83)

No. 89: Bruce, B. C., Collins, A., Rubin, A. D., & Gentner, D. ***A Cognitive Science Approach to Writing,*** June 1978. (ERIC Document Reproduction Service No. ED 157 039, 57p., PC-$4.82, MF-$.83)

No. 90: Asher, S. R. ***Referential Communication,*** June 1978. (ERIC Document Reproduction Service No. ED 159 597, 71p., PC-$4.82, MF-$.83)

No. 91: Royer, J. M., & Cunningham, D. J. ***On the Theory and Measurement of Reading Comprehension,*** June 1978. (ERIC Document Reproduction Service No. ED 157 040, 63p., PC-$4.82, MF-$.83)

No. 92: Mason, J. M., Kendall, J. R. ***Facilitating Reading Comprehension Through Text Structure Manipulation,*** June 1978. (ERIC Document Reproduction Service No. ED 157 041, 36p., PC-$3.32, MF-$.83)

No. 93: Ortony, A., Schallert, D. L., Reynolds, R. E., & Antos, S. J. ***Interpreting Metaphors and Idioms: Some Effects of Context on Comprehension*** July 1978. (ERIC Document Reproduction Service No. ED 157 042, 41p., PC-$3.32, MF-$.83)

No. 94: Brown, A. L., Campione, J. C., & Barclay, C. R. ***Training Self-Checking Routines for Estimating Test Readiness: Generalization from List Learning to Prose Recall,*** July 1978. (ERIC Document Reproduction Service No. ED 158 226, 41p., PC-$3.32, MF-$.83)

No. 95: Reichman, R. ***Conversational Coherency,*** July 1978. (ERIC Document Reproduction Service No. ED 159 658, 86p., PC-$6.32, MF-$.83)

No. 96: Wigfield, A., & Asher, S. R. ***Age Differences in Children's Referential Communication Performance: An Investigation of Task Effects,*** July 1978. (ERIC Document Reproduction Service No. ED 159 659, 31p., PC-$3.32, MF-$.83)

No. 97: Steffensen, M. S., Joag-dev, C., & Anderson, R. C. ***A Cross-Cultural Perspective on Reading Comprehension,*** July 1978. (ERIC Document Reproduction Service No. ED 159 660, 41p., PC-$3.32, MF-$.83)

No. 98: Green, G. M. ***Discourse Functions of Inversion Construction,*** July 1978. (ERIC Document Reproduction Service No. ED 160 998, 42p., PC-$3.32, MF-$.83)

No. 99: Asher, S. R. ***Influence of Topic Interest on Black Children and White Children's Reading Comprehension,*** July 1978. (ERIC Document Reproduction Service No. ED 159 661, 35p., PC-$3.32, MF-$.83)

No. 100: Jenkins, J. R., Pany, D., & Schreck, J. ***Vocabulary and Reading Comprehension: Instructional Effects,*** August 1978. (ERIC Document Reproduction Service No. ED 160 999, 50p., PC-$3.32, MF-$.83)

No. 101: Shoben, E. J., Rips, L. J., & Smith, E. E. ***Issues in Semantic Memory: A Response to Glass and Holyoak,*** August 1978. (ERIC Document Reproduction Service No. ED 159 662, 85p., PC-$6.32, MF-$.83)

No. 102: Baker, L., & Stein, N. L. ***The Development of Prose Comprehension Skills,*** September 1978. (ERIC Document Reproduction Service No. ED 159 663, 69p., PC-$4.82, MF-$.83)

No. 103: Fleisher, L. S., Jenkins, J. R., & Pany, D. ***Effects on Poor Readers' Comprehension of Training in Rapid Decoding,*** September 1978. (ERIC Document Reproduction Service No. ED 159 664, 39p., PC-$3.32, MF-$.83)

No. 104 Anderson, T. H. ***Study Skills and Learning Strategies,*** September 1978. (ERIC Document Reproduction Service No. ED 161 000, 41p., PC-$3.32, MF-$.83)

No. 105 Ortony, A. ***Beyond Literal Similarity,*** October 1978. (ERIC Document Reproduction Service No. ED 166 635, 58p., PC-$4.82, MF-$.83)

No. 106 Durkin, D. ***What Classroom Observations Reveal about Reading Comprehension Instruction,*** October 1978. (ERIC Document Reproduction Service No. ED 162 259, 94p., PC-$6.32, MF-$.83)

No. 107 Adams, M. J. ***Models of Word Recognition,*** October 1978. (ERIC Document Reproduction Service No. ED 163 431, 93p., PC-$6.32, MF-$.83)

No. 108 Reder, L. M. ***Comprehension and Retention of Prose: A Literature Review,*** November 1978. (ERIC Document Reproduction Service No. ED 165 114, 116p., PC-$7.82, MF-$.83)

No. 109 Wardrop, J. L., Anderson, T. H., Hively, W., Anderson, R. I., Hastings, C. N., & Muller, K. E. ***A Framework for Analyzing Reading Test Characteristics,*** December 1978. (ERIC Document Reproduction Service No. ED 165 117, 65p., PC-$4.82, MF-$.83)

No. 110 Tirre, W. C., Manelis, L., & Leicht, K. L. ***The Effects of Imaginal and Verbal Strategies on Prose Comprehension in Adults,*** December 1978. (ERIC Document Reproduction Service No. ED 165 116, 27p., PC-$3.32, MF-$.83)

No. 111 Spiro, R. J., & Tirre, W. C. ***Individual Differences in Schema Utilization During Discourse Processing,*** January 1979. (ERIC Document Reproduction Service No. ED 166 651, 29p., PC-$3.32, MF-$.83)

No. 112 Ortony, A. ***Some Psycholinguistic Aspects of Metaphor,*** January 1979. (ERIC Document Reproduction Service No. ED 165 115, 38p., PC-$3.32, MF-$.83)

No. 113 Antos, S. J. ***Processing Facilitation in a Lexical Decision Task,*** January 1979. (ERIC Document Reproduction Service No. ED 165 129, 84p., PC-$6.32, MF-$.83)

No. 114 Gentner D. ***Semantic Integration at the Level of Verb Meaning,*** February 1979. (ERIC Document Reproduction Service No. ED 165 130, 39p., PC-$3.32, MF-$.83)

No. 115 Gearhart, M., & Hall, W. S. ***Internal State Words: Cultural and Situational Variation in Vocabulary Usage,*** February 1979. (ERIC Document Reproduction Service No. ED 165 131, 66p., PC-$4.82, MF-$.83)

No. 116 Pearson, P. D., Hansen, J., & Gordon, C. ***The Effect of Background Knowledge on Young Children's Comprehension of Explicit and Implicit Information,*** March 1979. (ERIC Document Reproduction Service No. ED 169 521, 26p., PC-$3.32, MF-$.83)

No. 117 Barnitz, J. G. ***Reading Comprehension of Pronoun-Referent Structures by Children in Grades Two, Four, and Six,*** March 1979.

No. 118 Nicholson, T., Pearson, P. D., & Dykstra, R. ***Effects of Embedded Anomalies and Oral Reading Errors on Children's Understanding of Stories,*** March 1979. (ERIC Document Reproduction Service No. ED 169 524, 43p., PC-$3.32, MF-$.83)

No. 119 Anderson, R. C., Pichert, J. W., & Shirey, L. L. ***Effects of the Reader's Schema at Different Points in Time,*** April 1979. (ERIC Document Reproduction Service No. ED 169 523, 36p., PC-$3.32, MF-$.83)

No. 120 Canney, G., & Winograd, P. ***Schemata for Reading and Reading Comprehension Performance,*** April 1979. (ERIC Document Reproduction Service No. ED 169 520, 99p., PC-$6.32, MF-$.83)

No. 121 Hall, W. S., & Guthrie, L. F. ***On the Dialect Question and Reading,*** May 1979. (ERIC Document Reproduction Service No. ED 169 522, 32p., PC-$3.32, MF-$.83)

No. 122 McClure, E., Mason, J., & Barnitz, J. ***Story Structure and Age Effects on Children's Ability to Sequence Stories,*** May 1979.

No. 123 Kleiman, G. M., Winograd, P. N., & Humphrey, M. M. ***Prosody and Children's Parsing of Sentences,*** May 1979.

No. 124 Spiro, R. J. ***Etiology of Reading Comprehension Style,*** May 1979.

No. 125 Hall, W. S., & Tirre, W. C. ***The Communicative Environment of Young Children: Social Class, Ethnic, and Situational Differences,*** May 1979.

No. 126 Mason, J., & McCormick, C. ***Testing the Development of Reading and Linguistic Awareness,*** May 1979.

No. 127 Brown, A. L., & Campione, J. C. ***Permissible Inferences from the Outcome of Training Studies in Cognitive Development Research,*** May 1979.

No. 128 Brown, A. L., & French, L. A. ***The Zone of Potential Development: Implications for Intelligence Testing in the Year 2000,*** May 1979.

No. 129 Nezworski, T., Stein, N. L., & Trabasso, T. ***Story Structure Versus Content Effects on Children's Recall and Evaluative Inferences,*** June 1979.

No. 130: Bruce, B. *Analysis of Interacting Plans as a Guide to the Understanding of Story Structure*, June 1979.

No. 131: Pearson, P. D., Raphael, T., TePaske, N., & Hyser, C. *The Function of Metaphor in Children's Recall of Expository Passages*, July 1979.

No. 132: Green, G. M. *Organization, Goals, and Comprehensibility in Narratives: Newswriting, a Case Study*, July 1979.

No. 133: Kleiman, G. M. *The Scope of Facilitation of Word Recognition from Single Word and Sentence Frame Contexts*, July 1979.

No. 134: McConkie, G. W., Hogaboam, T. W., Wolverton, G. S., Zola, D., & Lucas, P. A. *Toward the Use of Eye Movements in the Study of Language Processing*, August 1979.

No. 135: Schwartz, R. M. *Levels of Processing: The Strategic Demands of Reading Comprehension*, August 1979.

No. 136: Anderson, R. C., & Freebody, P. *Vocabulary Knowledge*, August 1979.

No. 137: Royer, J. M., Hastings, C. N., & Hook, C. *A Sentence Verification Technique for Measuring Reading Comprehension*, August 1979.

No. 138: Spiro, R. J. *Prior Knowledge and Story Processing: Integration, Selection, and Variation*, August 1979.